CLAIMS

It is claimed:

1. A system for storing and dispensing a plurality of reagents, comprising:

an addressable array of reagent dispensers;

a gate mechanism at a lower outlet region of each dispenser, each gate mechanism being independently operable between (i) an opened condition permitting passage of a respective reagent through said outlet region, and (ii) a closed condition whereat such passage is blocked;

a first support disposed below said array;

a second support mounted on said first support, said second support having a holding area for receiving a plurality of receptacles;

wherein (i) said first support is variably positionable in a fashion permitting placement of a fixed target region thereof directly under any selected one of said dispensers in said array, and (ii) said second support is variably positionable in a fashion permitting placement of any selected target site of said holding area directly over said fixed target region.

2. The system of claim 1, wherein said dispensers are elongated containers, each having a longitudinally extending passageway configured to receive and hold a respective reagent when said gate mechanism is in the closed condition.

3. The system of claim 2, further comprising a rack having an array of at least about 100 holding cells, each holding cell being configured to removably support one of said containers in a substantially upright fashion.

4. The system of claim 3, wherein said holding cells are disposed at an average density of at least about 3 holding cells per cm^2.

5. The system of claim 4, wherein said array includes at least about 500 holding cells; and wherein said holding cells are disposed at an average density of at least about 4 holding cells per cm^2.

6. The system of claim 5, wherein said array includes at least about 1,000 holding cells.

7. The system of claim 6, wherein said array includes at least about 10,000 holding cells.

8. The system of claim 7, wherein said array includes at least about 100,000 holding cells.

9. The system of claim 2, further comprising a plurality of different reagents disposed in said dispenser passageways.

10. The system of claim 9, wherein each of said passageways contains a reagent that is unique to said array.

11. The system of claim 9, further comprising a plurality of bead lots, each lot comprised of a plurality of substantially similar beads carrying a respective one of said different reagents.

12. The system of claim 11, wherein each bead has a diameter of less than about a millimeter.

13. The system of claim 12, further comprising

a plurality of sealed ampules, said ampules being dimensioned to move downward through any one of said passageways under the force of gravity in a substantially single-file fashion;

wherein each ampule contains beads from the same or substantially identical lots, and wherein each passageway is loaded with a plurality of such ampules.

14. The system of claim 1, wherein said first and second supports are independently operable xy stages.

15. The system of claim 1, further comprising a detection assembly having a field of view extending between said dispenser outlet regions and said second support, and adapted to detect the passage of reagent dispensed from any one of said dispensers.

16. The system of claim 15, wherein said detection assembly includes

(i) a radiation emitter that is (a) mounted on said first support at a region along one side of said second support, and (b) configured to project a substantially linear radiation beam along a pathway that passes over said fixed target region of said first support; and

(ii) a radiation sensor that is (a) mounted on said first support at a region along an opposing side of said second support, and (b) disposed within said radiation-beam pathway.

17. The system of claim 1, wherein each gate mechanism is subject to a normal biasing force that urges it to the closed position, thereby preventing the passage of reagent through a respective outlet region.

18. The system of claim 17, further comprising a release mechanism positionable near any one of said gate mechanisms and operable to apply a secondary force of a magnitude and direction effective to override the normal biasing force so that the gate mechanism assumes the opened condition.

19. The system of claim 18,

wherein each gate mechanism includes a magnetic pinch valve having first and second magnets (i) that are pivotally mounted in facing relation at a respective outlet region and (ii) that have lower, confronting north and south pole regions, respectively, that are normally urged toward one another by magnetic forces so as to pivot said magnets to the closed condition.

20. The system of claim 19,

wherein said release mechanism is an electromagnet positioned adjacent said radiation-beam pathway, said electromagnet operable to generate said secondary force as a magnetic force having south and north pole portions disposed to attract the north and south pole lower regions of said first and second magnets, respectively, so that said lower regions pivot away from one another.

21. The system of claim 18,

wherein each gate mechanism is a resiliently deflectable lever having a protrusion normally extending into a respective outlet region.

22. The system of claim 21,

wherein said release mechanism is a rod adapted for motion from a retracted position to an extended position adjacent said radiation-beam pathway, said rod adapted to apply said secondary force as a mechanical force by engaging and deflecting said lever, when moved to said extended position, so that said protrusion is at least partially withdrawn from said outlet region.

23. The system of claim 1, further comprising

a guide member located over said fixed target region of said first support, between said dispenser array and said second support;

said guide member (i) disposed for movement with said first support to a position under any selected dispenser, and (ii) configured to channel reagent dispensed from such dispenser to a selected site on said holding area of said second support.

24. The system of claim 23, wherein said guide member includes

(i) an upper opening alignable with any one of said outlet regions for receiving reagent dispensed therefrom;

(ii) a lower opening, smaller than said upper opening, through which dispensed reagent may egress in route to said holding area; and

(iii) a conical portion between said upper and lower openings.

25. A reagent dispenser assembly, comprising:

a container adapted to receive a reagent;

a gate mechanism located at a lower outlet region of said container;

said gate mechanism including first and second permanent magnets (i) that are pivotally mounted in facing relation at said lower outlet region and (ii) that have lower, confronting north and south pole regions, respectively, that are normally urged toward one another by a magnetic force so as to pivot said magnets to a closed condition whereat the egression of reagent from said container is substantially blocked.

26. The reagent dispenser of claim 25, further comprising:

an electromagnet disposed below said gate mechanism,

said electromagnet being operable to generate a magnetic force having south and north pole portions disposed to attract the north and south lower regions of said first and second magnets, respectively, so that said lower regions pivot away from one another to an opened condition, permitting the egression of reagent from said container.

27. The reagent dispenser of claim 26, further comprising

a rack holding a plurality of said containers at respective locations defining an array; and

a first movable support disposed below said rack;

wherein said electromagnetic is mounted on said movable support.

28. The reagent dispenser of claim 27, further comprising

a second movable support mounted on said first movable support, under said electromagnet;

said second movable support configured to receive and hold a multi-well plate for receiving reagents from said containers.

29. A method for loading a plurality of receptacles with one or more reagents, comprising:

(i) placing a plurality of receptacles on a support under an addressable array of reagent dispensers;

(ii) selecting a dispenser equipped to dispense a desired reagent, and a receptacle for receiving the desired reagent;

(iii) simultaneously (a) positioning a fixed target region of the support at a location under the selected dispenser, and (b) positioning the selected receptacle at a location directly over the fixed target region of the support;

(iv) dispensing the desired reagent from the selected dispenser into the selected receptacle;

(v) detecting the desired reagent as it is dispensed from the selected dispenser; and

(vi) repeating steps (ii) - (v) so that reagent is dispensed from at least one other dispenser into at least one other receptacle.

30. The method of claim 29, wherein each of said receptacles is a well of a multi-well tray.

31. The method of claim 29, wherein each of said dispensers is equipped to dispense an analyte-specific reagent that is unique to said array.

32. The method of claim 29, wherein at least 100 different analyte-specific reagents are dispensed from respective dispensers into respective receptacles.

33. The method of claim 32, wherein at least 500 different analyte-specific reagents are dispensed from respective dispensers into respective receptacles.